WHAT IS CLAIMED IS:

1. A method for the production of plastic parts, comprising the steps that

the plastic parts are injection-moulded by means of a moulding tool (5; 107), and

the moulding tool (5; 107) is, after the injection-moulding, displaced together with the plastic part,

characterised in that it further includes the steps that

the moulding tool (5; 107) is closed,

the moulding tool (5; 107) is subjected to a first force for holding together thereof;

an injection-moulding nozzle (23) is positioned in the moulding tool; and

the moulding tool (5; 107) is subjected to a second force which is greater than the first force for holding together thereof;

and, after the injection-moulding, the step that

the moulding tool (5; 107) is released of loading.

2. The method as claimed in Claim 1, wherein each plastic part is permitted to cool during the displacement.

3. The method as claimed in Claim 1 or 2, wherein each plastic part, after the injection-moulding, is displaced in relation to an injection-moulding position to a cooling position.

4. The method as claimed in Claim 3, wherein each plastic part is permitted to cool in the cooling position.

5. The method as claimed in Claim 1, wherein the moulding tool is subjected to the first force during the displacement.

6. The method as claimed in Claim 1 wherein the moulding tool (5; 107) is opened after the displacement.

7. The method as claimed in any of the preceding Claims, wherein injection-moulding of a plastic part takes place in the injection-moulding position at the same time as another previously injection-moulded plastic part is located in the cooling position.

8. The method as claimed in Claim 1, wherein a plastic part in the form of a top section (25) is injection-moulded on one end of a sleeve (22) for forming a packaging container.

9. The method as claimed in Claim 8, wherein, in the positioning of the injection-moulding nozzle (23), the sleeve (22) is positioned in relation to the moulding tool (5; 107).

10. The method as claimed in any of Claims 1 to 7, wherein plastic parts in the form of opening arrangements are injection-moulded in apertures in a material web (101).

11. The method as claimed in Claim 10, wherein, in the positioning of the injection-moulding nozzle (23), the material web (101) is positioned in relation to the moulding tool (5; 107).

12. An apparatus for producing plastic parts, the apparatus having an injection-moulding nozzle (23), a moulding tool (5; 107) with co-operating mould parts or halves, which has an open and a closed position, as well as means (2, 100) for displacement of each plastic part in relation to an injection-moulding position where injection-moulding takes place, and means (2; 108, 109) for displacement of the moulding tool (5; 107) in the closed state together with the plastic part, **characterised in that** it further comprises a unity device (15) for holding together the mould parts (6) during the injection-moulding, wherein the unity device (15) is disposed to apply a first force and a second force on the mould parts (6) for holding together thereof, the second force being greater than the first.

13. The apparatus as claimed in Claim 12 which further displays a cam mechanism (17) for opening and closing, respectively, of the moulding tool by displacement of the mould parts (6) away from and towards one another, respectively.

14. The apparatus as claimed in Claim 13, which further displays retainer means (7) for supporting and displacing the mould parts (6).

15. The apparatus as claimed in Claim 14, wherein each retainer means (7) has a wheel (11) which is disposed to follow a cam groove (19).

16. The apparatus as claimed in Claim 15, wherein the wheel (11) is spring-biased.

17. The apparatus as claimed in Claim 12, which further displays means (24) for positioning the injection-moulding nozzle (23) in the moulding tool (5).

18. The apparatus as claimed in any of Claims 12 to 17, wherein the unity device (15) has a spring unit (13) for applying the first force.

19. The apparatus as claimed in any of Claims 12 to 18, wherein the unity device (15) has a piston and cylinder assembly (16) for applying the second force.

20. The apparatus as claimed in any of Claims 12 to 19, wherein said means (2) for displacing the moulding tool (5) comprises a rotary hub (4) and at least one arm (3) projecting radially out from the hub (4) and at whose radial outer end the moulding tool (5) is disposed.

21. The apparatus as claimed in Claim 20, wherein said means (2) for displacing the moulding tool (5) has five radial arms (3), one moulding tool (5) being disposed at the radial outer end of each arm (3) with symmetric distribution about the hub (4).

22. The apparatus as claimed in Claim 20 or 21, wherein the moulding tool (5) is disposed to be inserted in and removed from the unity device (15) by rotation about the hub (4).

23. The apparatus as claimed in any of Claims 12 to 19, wherein said means (108, 109) for displacing the moulding tool comprise pairwise disposed drive means.

24. The apparatus as claimed in Claim 23, which further includes means (100) for advancing, in a direction of advancement (M), a material web (101) on which the plastic parts are to be injection-moulded and at which said drive means (108, 109) are disposed on either side of a position in which the material web (101) is advanced.

25. The apparatus as claimed in Claim 23 or 24, wherein said drive means (108, 109) are disposed to displace the moulding tool (107) in the direction of advancement (M) of the material web (101) at a speed of displacement which is substantially the same as a speed of advancement at which the material web (101) is advanced.

26. The apparatus as claimed in Claim 24 or 25, wherein at least two moulding tools are disposed on each drive means.

27. The apparatus as claimed in any of Claims 23 to 26, wherein said drive means comprise rotary wheels (109).

28. The apparatus as claimed in any of Claims 23 to 26, wherein said drive means comprise endless belts (108).

29. The apparatus as claimed in any of Claims 23 to 26, wherein said drive means comprise endless chains (109).

30. The apparatus as claimed in any of Claims 12 to 22, which is disposed to produce plastic parts in the form of top sections (25) for packaging containers by injection-moulding of plastic parts on one end of a sleeve (22) of laminated paperboard.

31. The apparatus as claimed in any of Claims 12 to 19 or 23 to 29, which is disposed to produce plastic parts in the form of opening arrangements in a material web (101) of laminated paperboard intended for the production of packaging containers (110).

The union device is furthermore disposed to apply a first force and a second force on the mould parts for holding them together, the second force being greater than the first. As a result, certain adjustments in the united moulding tool may be put into effect before the greater force is applied, which ensures the unity of the moulding tool during the injection-moulding.

In one embodiment, the apparatus has a cam mechanism for opening and closing, respectively, of the moulding tool by displacement of the mould halves away from and towards one another, respectively. There will thereby be obtained a reliable mechanical control of the opening and closing of the moulding tool.

The apparatus may further be provided with retainer means for supporting and displacing the mould parts. This facilitates opening and closing of the moulding tool.

Preferably, each retainer means has a wheel which is disposed to follow a cam groove. This makes possible, in a simple manner, opening and closing of the moulding tool.

The wheels may be spring-biased, which renders the guiding and controlling of the mould halves less sensitive to wear to the cam groove.

The apparatus according to the present invention may further be provided with means for positioning the injection-moulding nozzle in the moulding tool. This makes for a high degree of precision in the injection-moulding.

The union device is provided, in one embodiment, with a spring for applying the first force. This is a simple and reliable method of realising the unity of the moulding tool.

The union device may further be provided with a cylinder for applying the second force. By such means, a large second force may be generated in a reliable manner.

According to one embodiment of the present invention, the means for displacing the moulding tool includes a rotary hub and at least one arm projecting radially outwardly from the hub, and at whose radial outer end the moulding tool is disposed. By such means, the moulding tool may simply be moved together with the plastic part.

SUMMARY OF THE INVENTION

The object of the present invention is therefore to realise a method for the production of plastic parts which makes for a sufficient cooling time without the manufacturing process becoming excessively slow. A further object of the present invention is to realise an apparatus for producing plastic parts which has been improved compared with prior art technology.

These objects will be attained according to the present invention in that the method of the type described by way of introduction is given the characterising feature as set forth in appended Claim 1. Preferred embodiments of the method are apparent from appended subclaims 2 to 11. The object of the present invention will also be attained by means of an apparatus as set forth in appended Claim 12, with preferred embodiments as disclosed in the appended subclaims 13 to 33.

The method according to the present invention thus utilises the feature that the moulding tool is, after the injection-moulding, displaced together with the plastic part. By such means, the cooling time of the plastic part in the moulding tool may be increased without the manufacturing process becoming slower. Moreover, prior to the injection-moulding, the moulding tool is closed, the moulding tool is subjected to a first force for holding it together, an injection-moulding nozzle is positioned in the moulding tool and the moulding tool is subjected to a second force which is greater than the first force for holding it together, and, after the injection-moulding, the method incorporates the step that the moulding tool is relieved of load. An injection-moulding may hereby be carried out with good precision.

According to one variation of the method according to the present invention, each plastic part is allowed to cool during the displacement operation, which extends the cooling time.

According to yet a further variation of the method according to the present invention, each plastic part is displaced after the injection-moulding in relation to an injection-moulding position in which the injection-moulding takes place, to a cooling position. This contributes in improved cooling.

Preferably, each plastic part is permitted to cool in the cooling position, which further prolongs the cooling time.

The first force may advantageously place the moulding tool under load during the displacement operation. As a result, the moulding tool is held reliably together.

According to a further variation of the method according to the invention, the moulding tool is opened after the displacement operation. By such means, the plastic part remains in the moulding tool during the displacement.

According to one preferred embodiment of the method according to the present invention, injection-moulding of a plastic part in the injection-moulding position takes place at the same time as another, previously injection-moulded plastic part is located in the cooling position. This renders the manufacturing process more efficient, since injection-moulding of one plastic part may be commenced before a previously injection-moulded plastic part has completely cooled.

In one variation of the method, a plastic part is injection-moulded in the form of a top section on one end of a sleeve for the formation of a packaging container. This is a rational method of manufacturing packaging containers.

Preferably, the sleeve is positioned in relation to the moulding tool on the positioning of the injection-moulding nozzle. Accurate precision will thereby be obtained in the positioning of the top section on the end of the sleeve.

According to another variation of the method according to the present invention, plastic parts are injection-moulded in the form of opening arrangements in apertures in a material web. This is a rational method of disposing opening arrangements in the material web. The material web may subsequently be formed into packaging containers.

Advantageously, the material web is positioned in relation to the moulding tool on the positioning of the injection-moulding tool, which affords a high degree of precision in the positioning of the opening arrangements in the material web.

The apparatus according to the present invention utilises means for displacing the moulding tool in its closed state together with the plastic part. This makes possible a prolonged cooling time at the same time as production output rate can be kept high. The apparatus further displays a union device for unifying the mould parts during the injection-moulding. This ensures that the moulding tool is held together during the injection-moulding.